

**RESEARCH ARTICLE :**

# Estimation of yield losses caused by pest in groundnut

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**SUMMARY :** The present study was undertaken to assess the relative abundance and extent of damage caused by the various pests attacking groundnut in the Marathwada region of the Maharashtra state during the 2012 and 2014 *Kharif* seasons. Selective applications of insecticides were deployed in field experiments to assess the damage caused by the key members of the groundnut pest complex namely the Aphids, jassid, thrips, defoliators, leaf miner and gram pod borer. The experiment was laid out in paired plot design with two treatments, replicated sixteen times. Pooled results showed that groundnut crop left unprotected is highly infested by pest and recorded significant yield reduction to the extent of 26.74 % as compared to crop protected through chemicals.

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**KEY WORDS :**

Groundnut, Leaf hopper, Thrips, Aphids, Leaf miner, Defoliators, Gram pod borer, Yield losses

**BACKGROUND AND OBJECTIVES**

Insects are the most diverse species of animals living on earth. Apart from the open ocean, insects can be found in all habitats; swamps, jungles, deserts, even in highly harsh environments such as pools of crude petroleum (Imms, 1964). Depending on the structure of the ecosystem in a given area and man's view point, a certain insect might or might not be considered a pest. Insect pests have been defined by Williams (1947) as any insect in the wrong place. Less than 0.5 percentage of the total number of the known insect species are considered pests, and only a few of these can be a serious menace to people, as they inflict damage to humans, farm

animals and crops.

Groundnut (*Arachis hypogaea* L.) is a leading oilseed crop in India and an important oilseed crop of tropical and subtropical regions of the world. The seed (kernels) contains up to 50 per cent of a non drying oil, 40-50 per cent fat, 20-50 per cent protein and 10-20 per cent carbohydrate (Mehta, 2002) so, it is a leading oilseed crop in India and grown in an area of 5.52 million ha with a production of 9.67 million tonnes and productivity of 1750 kg/ha. Six states namely Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan and Tamil Nadu account for about 90 per cent of the total groundnut area of the country. Andhra Pradesh and Gujarat contribute more

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than 55 per cent of the total area and production of groundnut (DAC, 2014). Though India ranks first in area under groundnut cultivation, the productivity is quite low compared to that of USA, China, Argentina and Indonesia (Anonymous, 2005). The reason for low productivity of groundnut is due to biotic and abiotic stresses during crop growth. Pests and diseases are the major biotic stresses for groundnut production. Groundnut crop is attacked by about 90 species of insect pests.

Recently, confirmed the relevance pests as key constraints in Marthwada region of the Maharashtra state of the country using combinations of farmer perception and direct field sampling (Anonymous, 2013) but detailed and systematic studies on the levels of damage caused were lacking. Therefore the study was undertaken to assess the relative abundance and extent of damage caused by, the various pests attacking groundnut in the region.

## RESOURCES AND METHODS

The experiments were conducted at field of Entomology section of Oilseeds Research Station, Latur during the year 2012-2013, 2013-2014 and 2014-2015 using groundnut variety LGN-1. The experiment was laid out in paired plot design with two treatments, and sixteen replication. The crop was sown at the spacing of 30 cm x 10 cm having gross and net plot size was 5 x 4.2 m<sup>2</sup>. and 4.8 x 3.6 m<sup>2</sup>, respectively. All the agronomical practices were followed as per recommendations. In first treatment (T<sub>1</sub>-protected), the spray application of dimethoate 0.03 %, chlorpyrifos 0.05 %, profenophos 0.05 % and imidacloprid 0.006 % were given with help of manually operated knapsack sprayer after the appearance of the pests while other treatment plots were completely left unsprayed. The observation on the pest population were recorded before and after 5 days of application of insecticides in both the treatment on five plants which were selected randomly from each plot and at the end of the experiment mean population of the pest in both the treatment was worked out and original data was transformed using square root transformation and further statistical analysis was carried out.

### Estimation of yield losses:

Pods received from protected and unprotected at harvest were recorded separately from each net plot and data so collected was subjected to analysis and result

obtained was compared using t test of significance. The increased yield over control and avoidable yield losses were computed using following formula (Pradhan, 1969).

$$\text{Percentage yield increase over control} = 100 \times \frac{T - C}{C}$$

$$\text{Avoidable yield losses} = 100 \times \frac{T - C}{T}$$

where,

T = Yield from treated Plot (kg/ha)

C = Yield from control Plot (kg/ha)

### Treatments details : Two

T<sub>1</sub> - Protected through chemical

T<sub>2</sub> - Unprotected

## OBSERVATIONS AND ANALYSIS

Data presented in the Table 1 to 4 reveals that, crop protected through chemicals was least infested by pest as compared to crop left unprotected, as mean population of protected plot was significantly less viz., Leafhoppers (0.44/pl), Thrips (0.47/pl), whitefly (0.24/pl), defoliators (0.63/pl) and gram pod borer (0.47/pl) of that Leafhoppers (2.39/pl), Thrips (3.66/pl), whitefly (1.38/pl), defoliators (3.51/pl) and gram pod borer (4.73/pl), respectively in unprotected plot. As a result of which crop left unprotected recorded significantly less yield. 1607 kg/ha as compared to crop protected through chemicals i.e. 2194 kg/ha. Similarly significant yield reduction to the extent of 26.74 per cent was recorded in unprotected treatment. As result protected treatment recorded highest net return of Rs. 21250, C:B ratio 1:2.92, and IBCR 1:4.11 over control.

The similar results of yield losses on groundnut were reported Singh and Ghevane (1981) reported 54.86 per cent yield reduction over control with application of phosalone 0.035 per cent. Upadhyay and Vyas (1983) estimated about 21.97 per cent avoidable loss of yield in untreated control plots of groundnut by application of monocrotophos 0.05 per cent against Jassids. On the similar line the yield losses upto 22.2 and 23. Per cent of

**Table 1 : Percentage loss in yield (Pooled data 2012-14)**

Sr. No.	Treatments	Yield (kg/ha)	Percentage loss
1.	Protected (T <sub>1</sub> )	2194	26.74%
2.	Unprotected (T <sub>2</sub> )	1607	
	'T' value	18.69**	

\*\* indicates significance of value at P=0.05

**Table 2 : Estimation of yield loss in groundnut (Pooled data 2012-14)**

Treatment (T <sub>1</sub> ) Protected through chemicals	Yield		Treatment (T <sub>2</sub> ) unprotected (Control)	Yield	
	kg/plot	kg/ha		kg/plot	kg/ha
1	3.65	2114	1	2.72	1574
2	3.74	2164	2	2.75	1593
3	3.86	2234	3	2.61	1508
4	3.66	2118	4	2.68	1551
5	3.90	2257	5	2.60	1505
6	3.52	2037	6	2.95	1705
7	3.53	2043	7	2.86	1655
8	3.75	2170	8	2.77	1603
9	3.77	2184	9	2.66	1539
10	3.69	2137	10	2.78	1609
11	3.68	2132	11	2.81	1624
12	3.83	2218	12	2.91	1682
13	4.09	2369	13	2.78	1610
14	4.13	2392	14	2.79	1615
15	3.92	2269	15	2.92	1687
16	3.91	2261	16	2.86	1653
Mean yield (kg/ha)	3.79	2194		2.78	1607
T value	18.69**				

\*\*indicates significance of value at P=0.05

**Table 3 : Economics of the protected over unprotected**

Sr. No.	Treatments	Cost of cultivation	Cost of treatments (Rs.)	Gross returns (Rs.)	Net returns (Rs.)	IR	C:B ratio	ICBR
1	Protected (T <sub>1</sub> )	20000	5165	98730	73565	21250	1:2.92	1:4.11
2.	Unprotected (T <sub>2</sub> )	20000	--	72315	52315		1:2.62	

\*IR= Incremental return over control; Cost of groundnut pods is considered as Rs. 45/kg

**Table 4 : Estimation of yield loss caused by pest in groundnut (Pooled data 2012-14)**

Replication	Unprotected					Protected				
	Leaf hopper	Thrips	Whiteflies	Defoliators	Gram pod borer	Leaf hopper	Thrips	Whiteflies	Defoliators	Gram pod borer
1	2.4	3.3	0.8	3.5	4.24	0.20	0.20	0.00	1.00	0.24
2	2.2	3.3	1.1	3.8	4.68	0.20	0.40	0.10	0.70	0.64
3	1.8	3.4	1.2	3.4	4.08	0.60	0.20	0.00	0.70	0.20
4	2.1	3.8	1	4.1	4.00	0.30	0.40	0.00	1.00	0.00
5	2.2	3.5	1.5	3.8	4.48	0.20	0.30	0.20	1.10	0.00
6	2.7	3.9	1.6	4.2	4.98	0.70	0.30	0.40	0.90	0.02
7	2.3	3.8	1.3	3.7	4.58	0.50	0.40	0.40	0.70	0.08
8	2.8	3.6	1.3	3.2	4.68	0.30	0.70	0.20	0.70	0.24
9	2.5	3.3	1.4	3	5.06	0.50	0.60	0.10	0.40	0.28
10	2.3	3.9	0.8	3	4.98	0.20	0.40	0.20	0.50	0.46
11	1.9	3.8	1	3.1	4.00	0.50	0.30	0.30	0.20	0.68
12	2.4	3.1	1.2	3.5	5.96	0.60	0.40	0.30	0.10	0.98
13	2.5	3.2	1.4	3.9	5.02	0.50	0.30	0.20	0.60	1.02
14	2.5	4.1	1.6	4.1	5.04	0.60	0.60	0.50	0.20	1.00
15	2.8	3.9	2.4	3	5.46	0.40	1.00	0.40	0.30	0.98
16	2.8	4.7	2.5	2.9	4.42	0.70	1.00	0.50	0.90	0.62
Mean	2.39	3.66	1.38	3.51	4.73	0.44	0.47	0.24	0.63	0.47
	1.70	2.04	1.37	2.00	2.29	0.97	0.98	0.86	1.06	0.98

Figures in bold are square root transformed values.

pod and fodder was reported by Kennedy *et al.* (1992) and Shetgar *et al.* (1992) recorded 40.34 per cent yield loss due to jassids, thrips and leaf miner in groundnut. Singh and Sancchan (1992) reported that groundnut crop is damaged by thrips, cicadelid and *Spilosoma obliqua* at vegetative and bloom stage resulted in 23.0 and 31.4 per cent yield loss. Hence, the crop protection measures against the pest at the vegetative and bloom stage found most effective in minimising the yield loss.

Marowoto (1998) suggested that the insects are one of the major constraint in groundnut production and noted that *Aproaerema modicella*, thrips and *Empoasca* spp. are having important role in reducing groundnut yield. without control measures yield losses of groundnut caused by pest were upto 90 per cent .

Bariya (2000) in his study found that the avoidable losses of 26.71 per cent in pods 28.19 per cent in fodder due to aphid, jassid, thrips, mites and gram caterpillar. The total yield loss due to insect pests of groundnut was up to 40.2% as observed by Baskaran *et al.* (2013).

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